

L2

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CLASS IX - SCIENCE



THE FUNDAMENTAL UNIT OF LIFE

PRASHANT KIRAD

TOPICS TO BE COVERED

Lecture 2

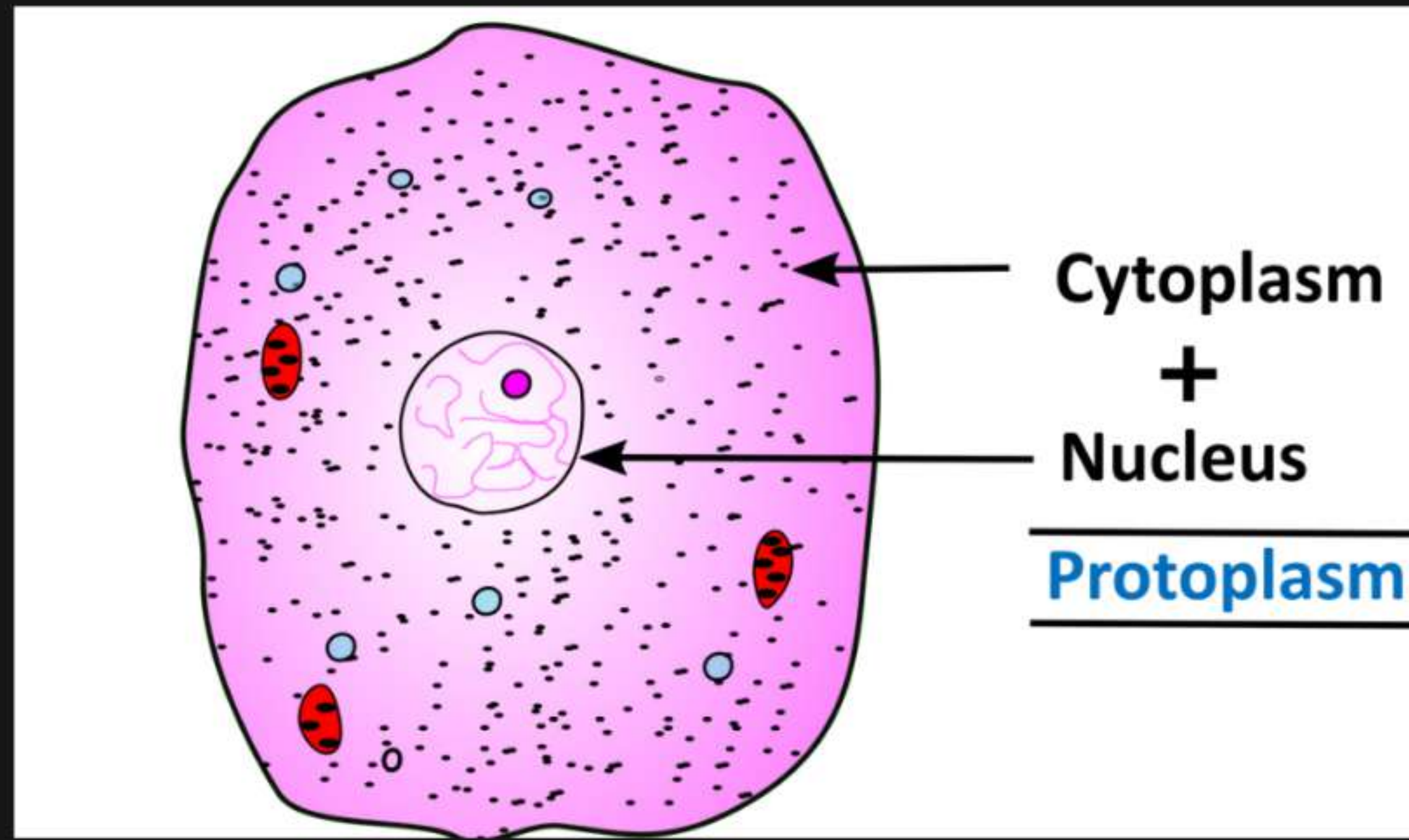
- Cell Organelles
- Cell Division
- Mitosis and Meiosis
- Animal and Plant Cells comparison



Chaliye Shuru Karte Hai !!

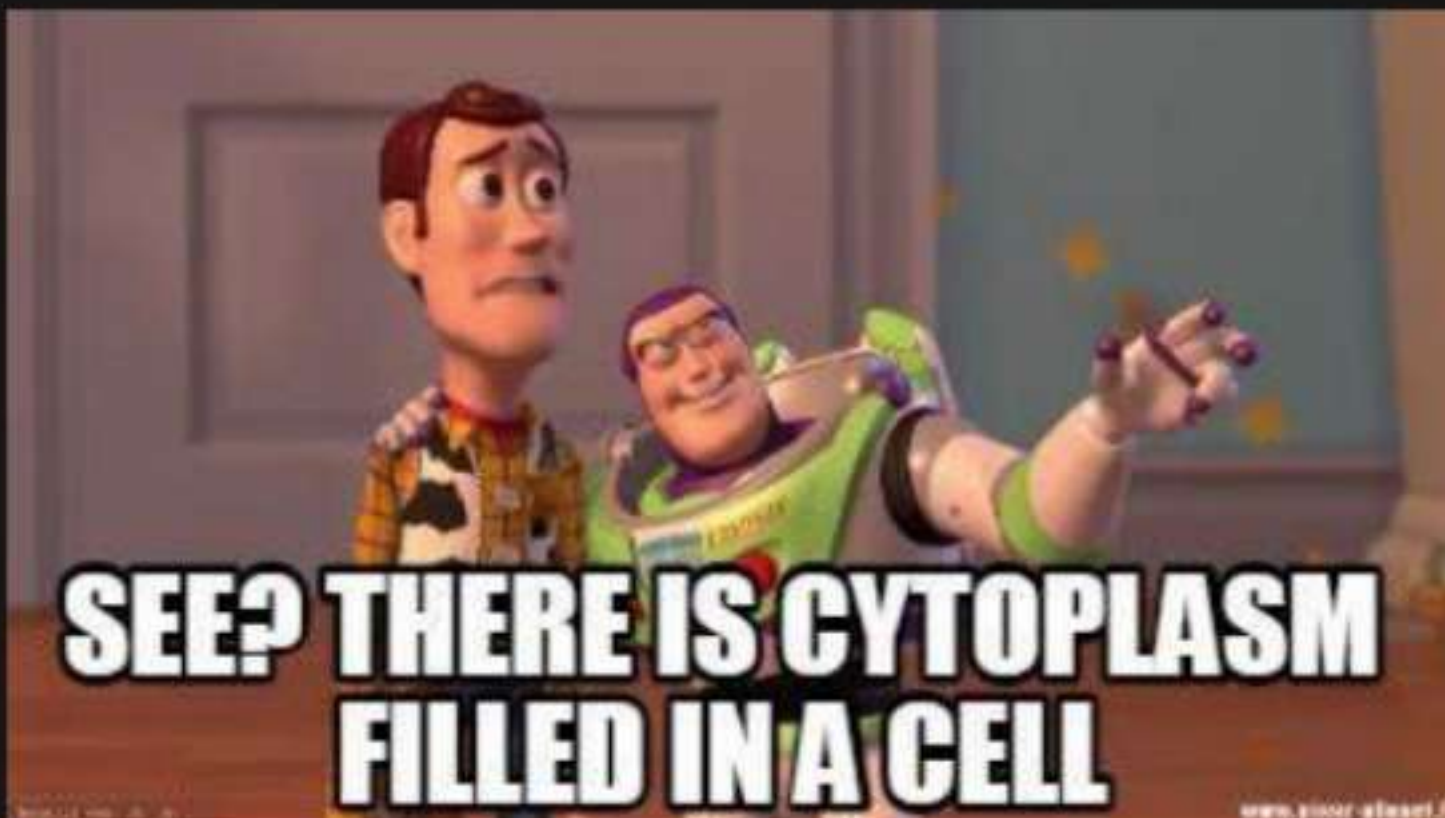
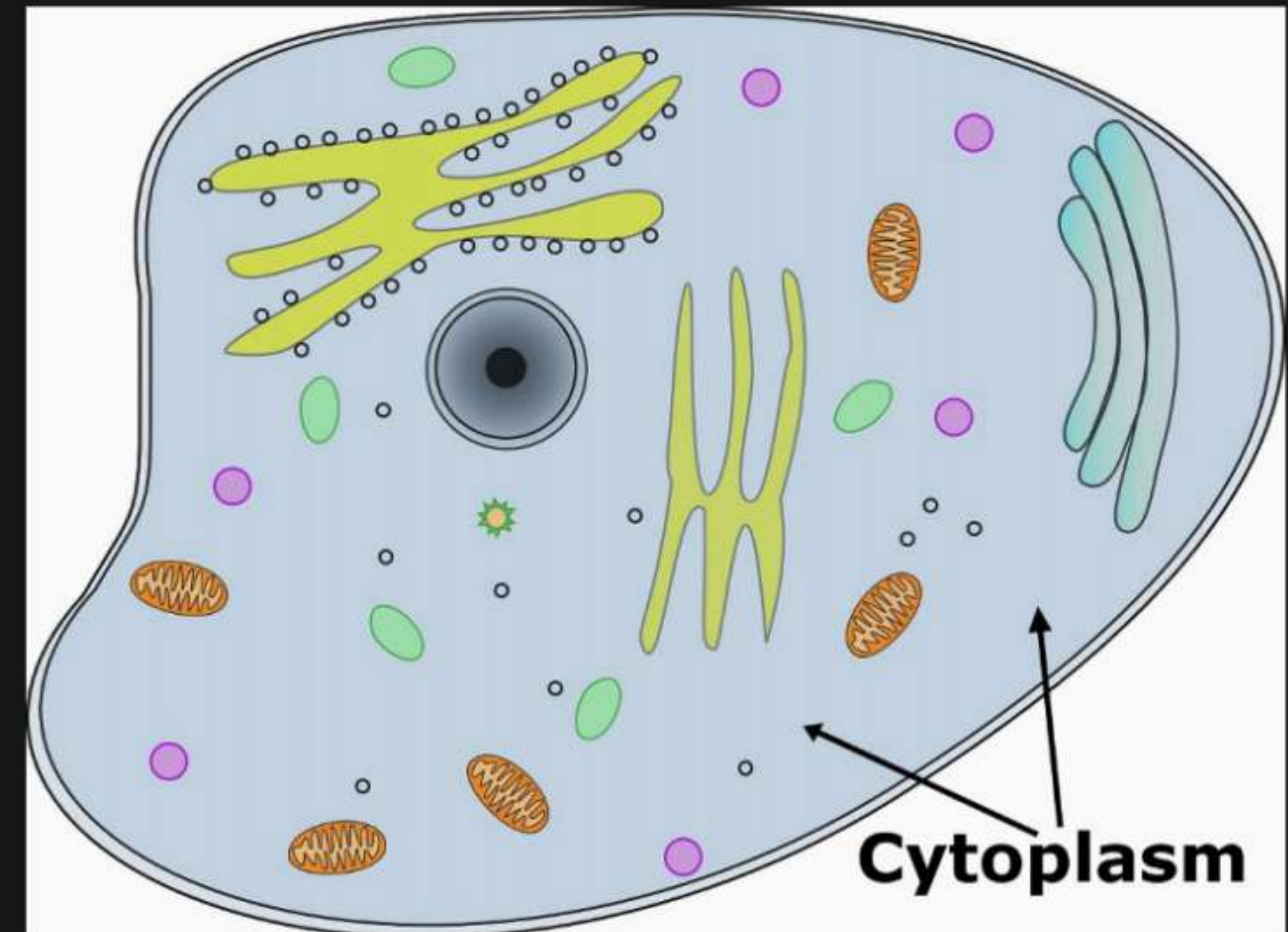
PROTOPLASM

Protoplasm is the living content within a cell, enclosed by the plasma membrane. It includes all the components that are essential for the cell's life functions, such as the cytoplasm and the nucleus.



CYTOPLASM

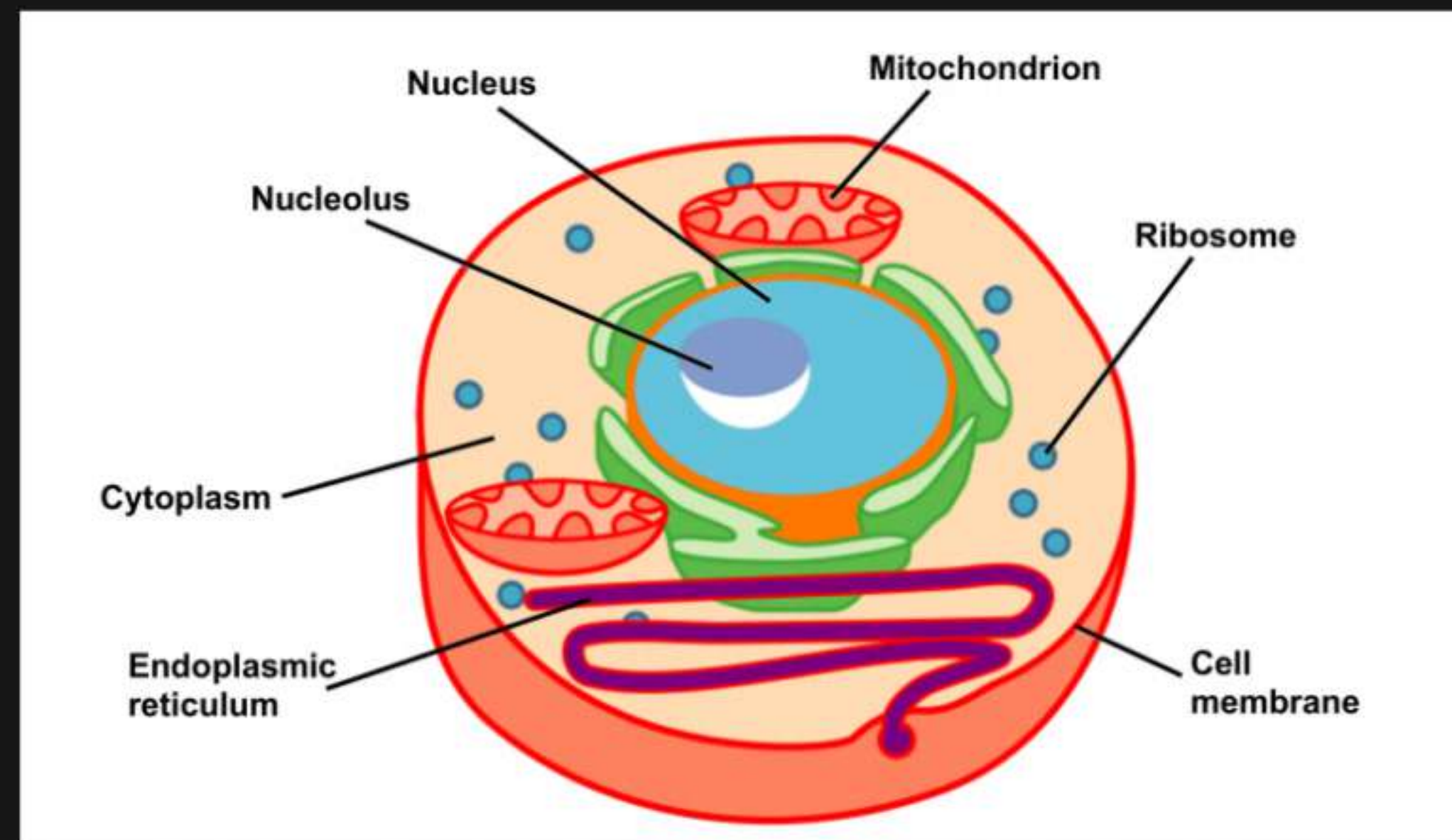
Cytoplasm is the jelly-like, semi-fluid substance that fills the interior of the cell, lying between the cell membrane and the nucleus. It is a critical component of the cell, where most cellular activities occur.



CELL ORGANELLES

Cell organelles are specialized structures within a cell that perform specific functions necessary for the cell's survival and proper functioning.

Each organelle has a unique role, similar to organs in a body.



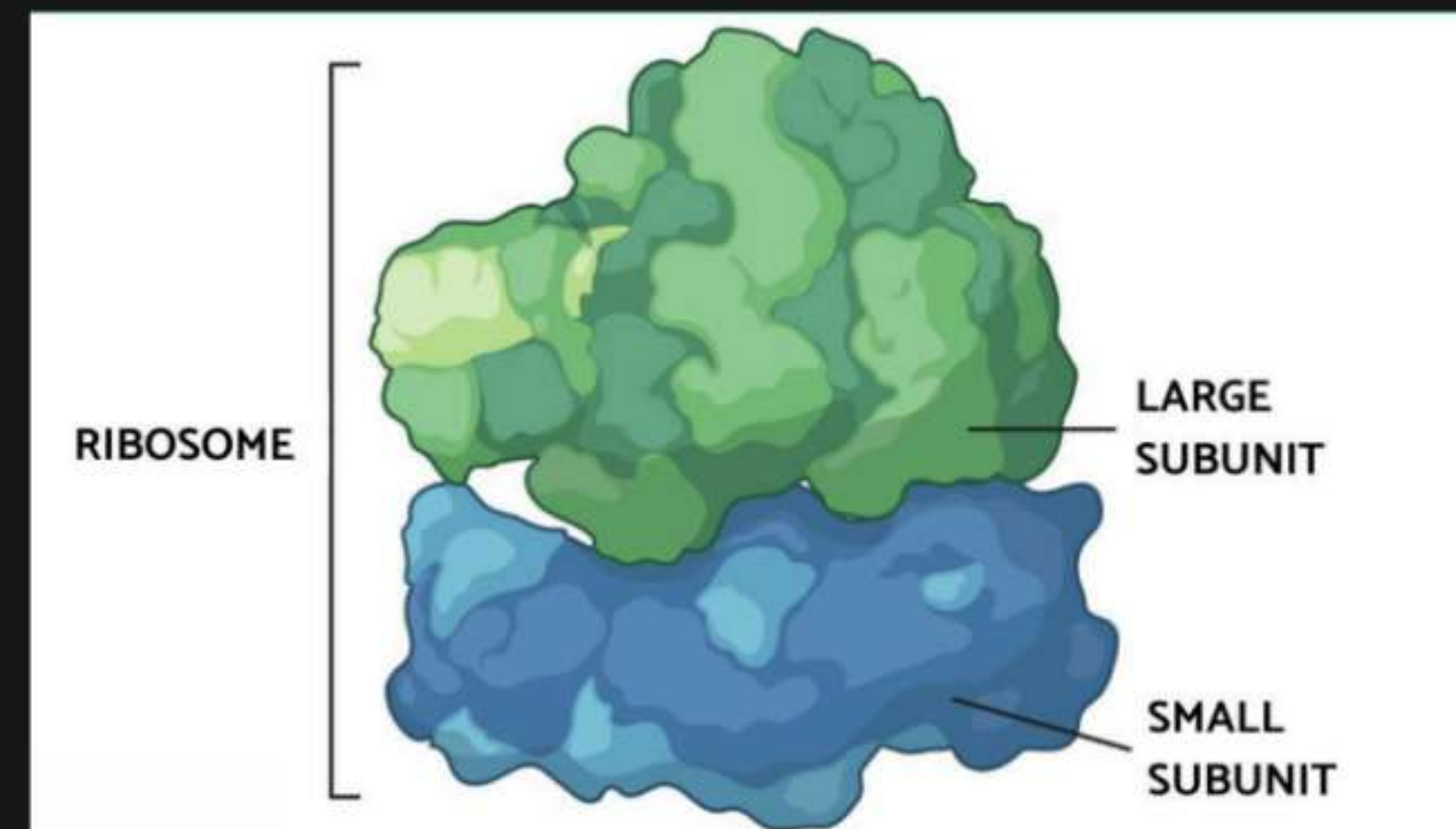
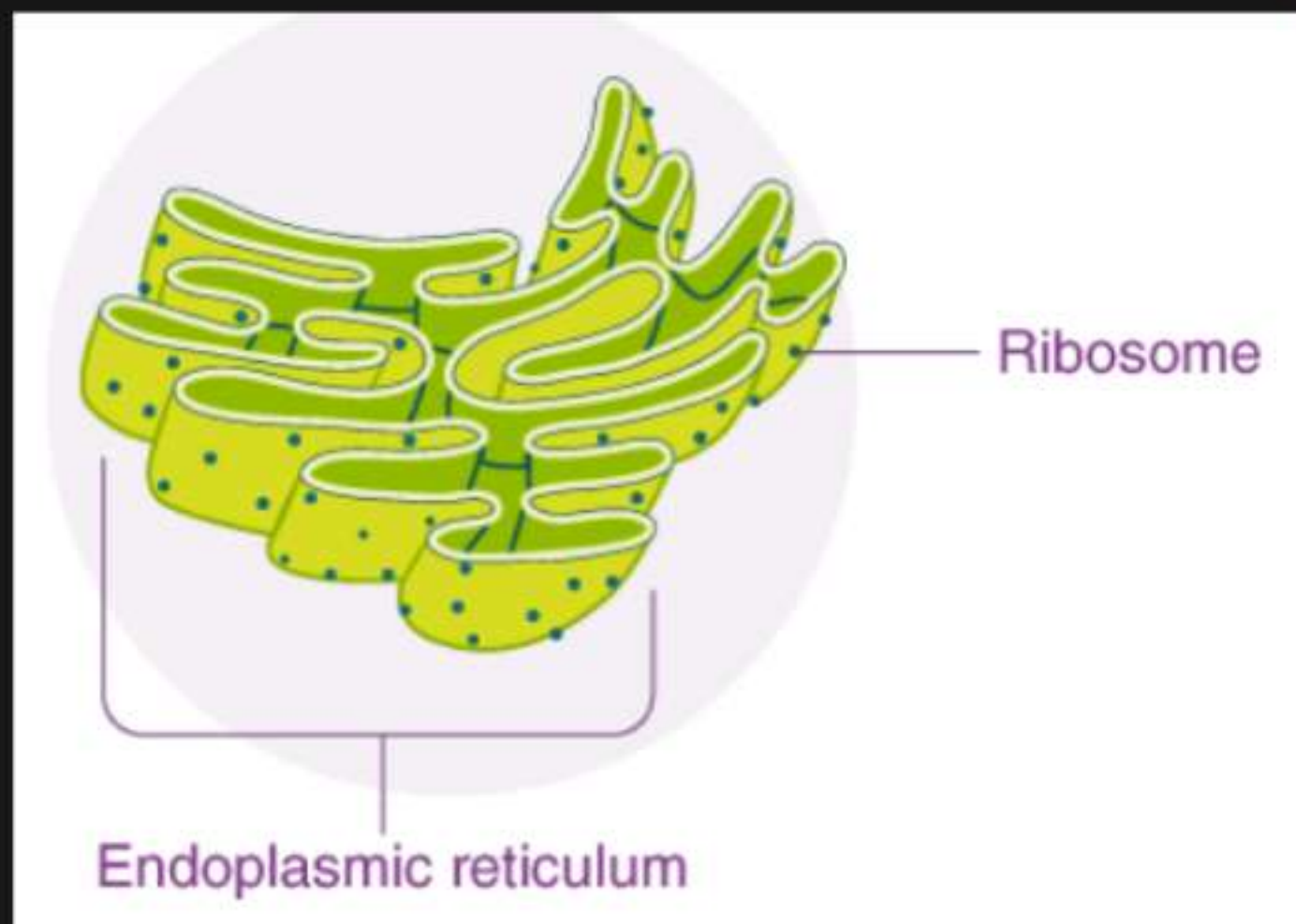
RIBOSOMES

Pro
Eu

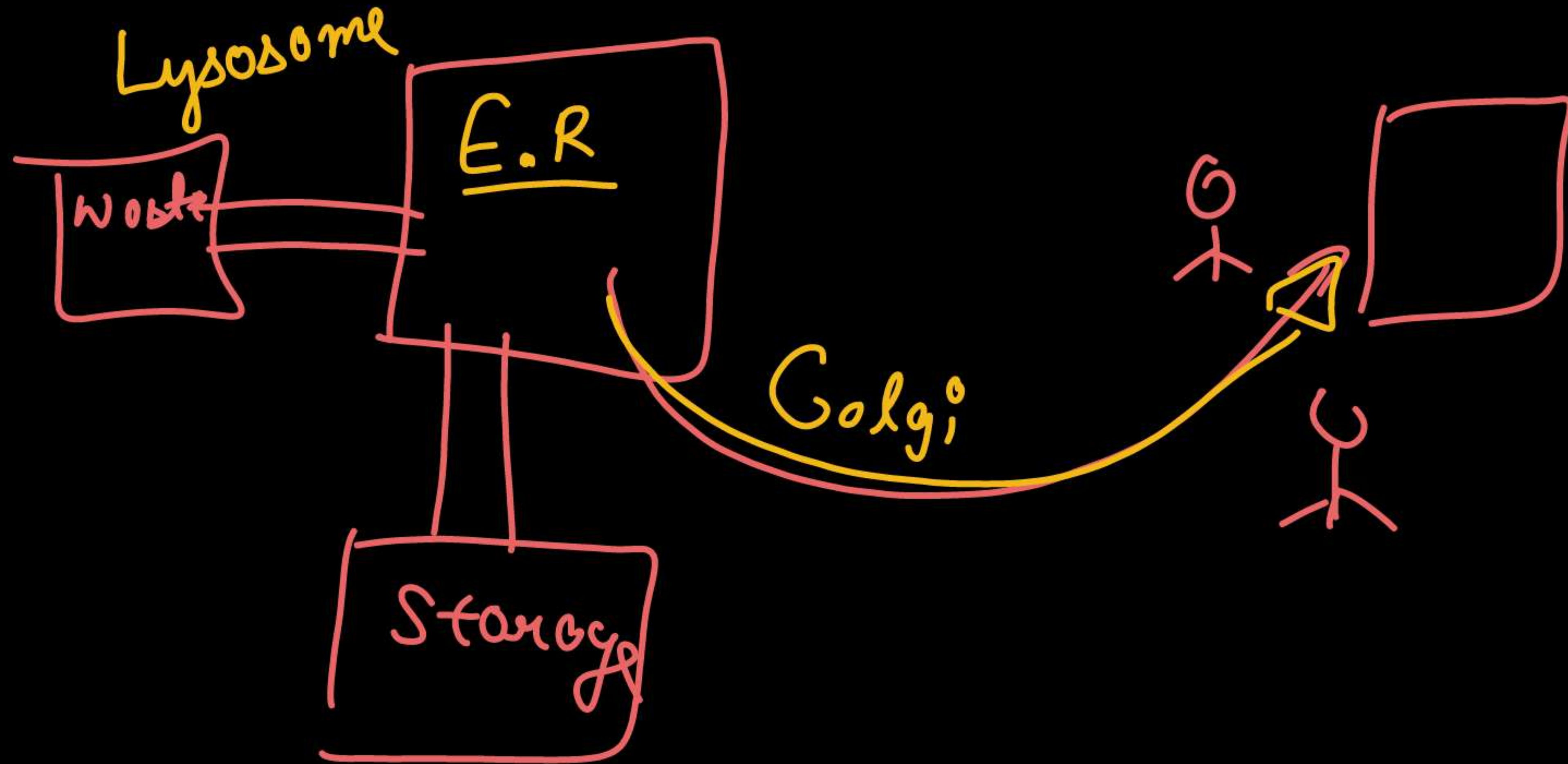
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Ribosomes are small, granular structures and they do not have a [Protein Factory] membrane.

Ribosomes play a crucial role in cellular function as they are the sites of protein synthesis, which is essential for cell growth, repair, and overall functioning of the organism.

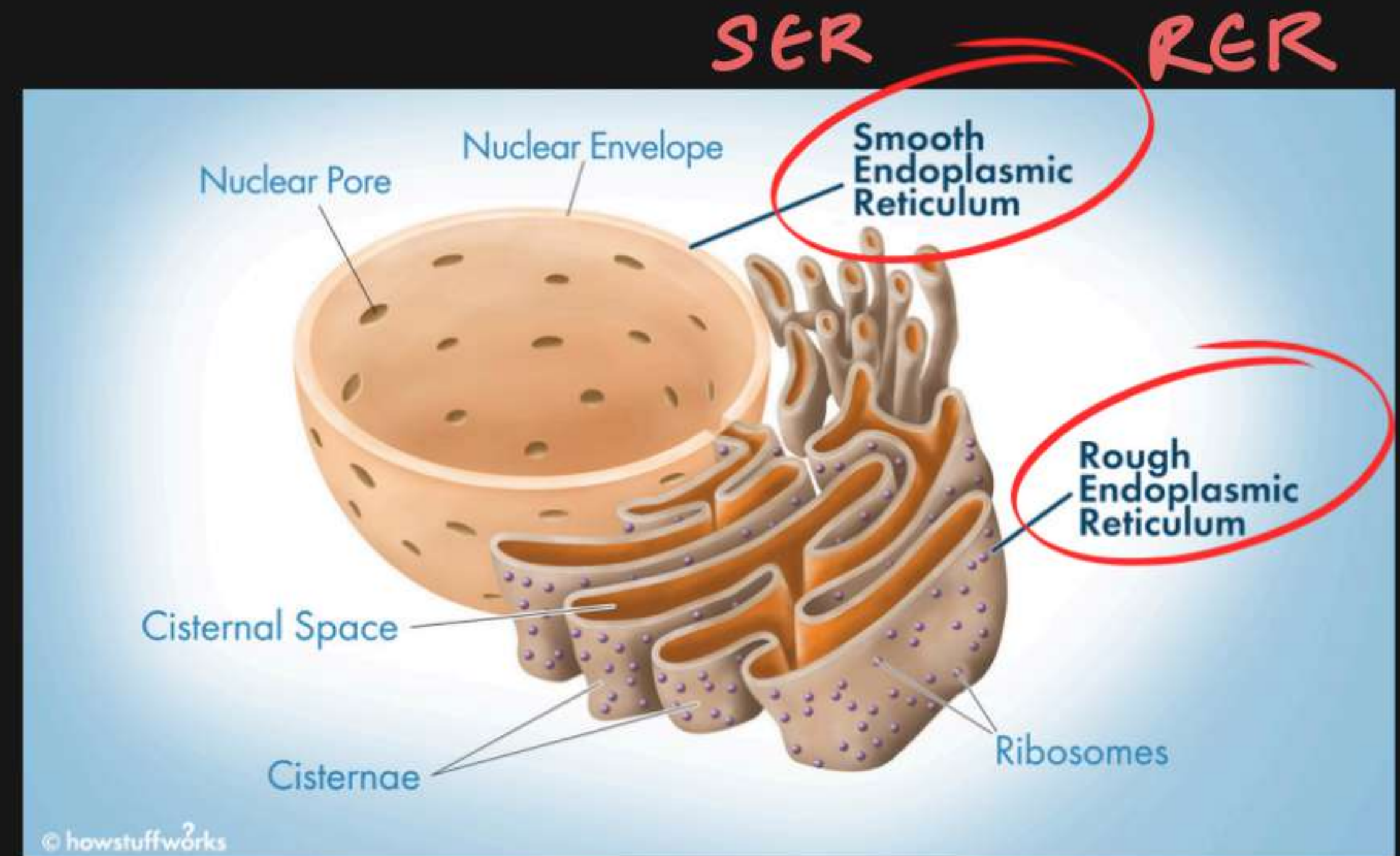


iPhone Factory



ENDOPLASMIC RETICULUM (E.R.)

The Endoplasmic Reticulum (ER) is a network of membranes within the cell that plays a key role in transporting substances, synthesizing proteins and lipids, and processing various cellular products.





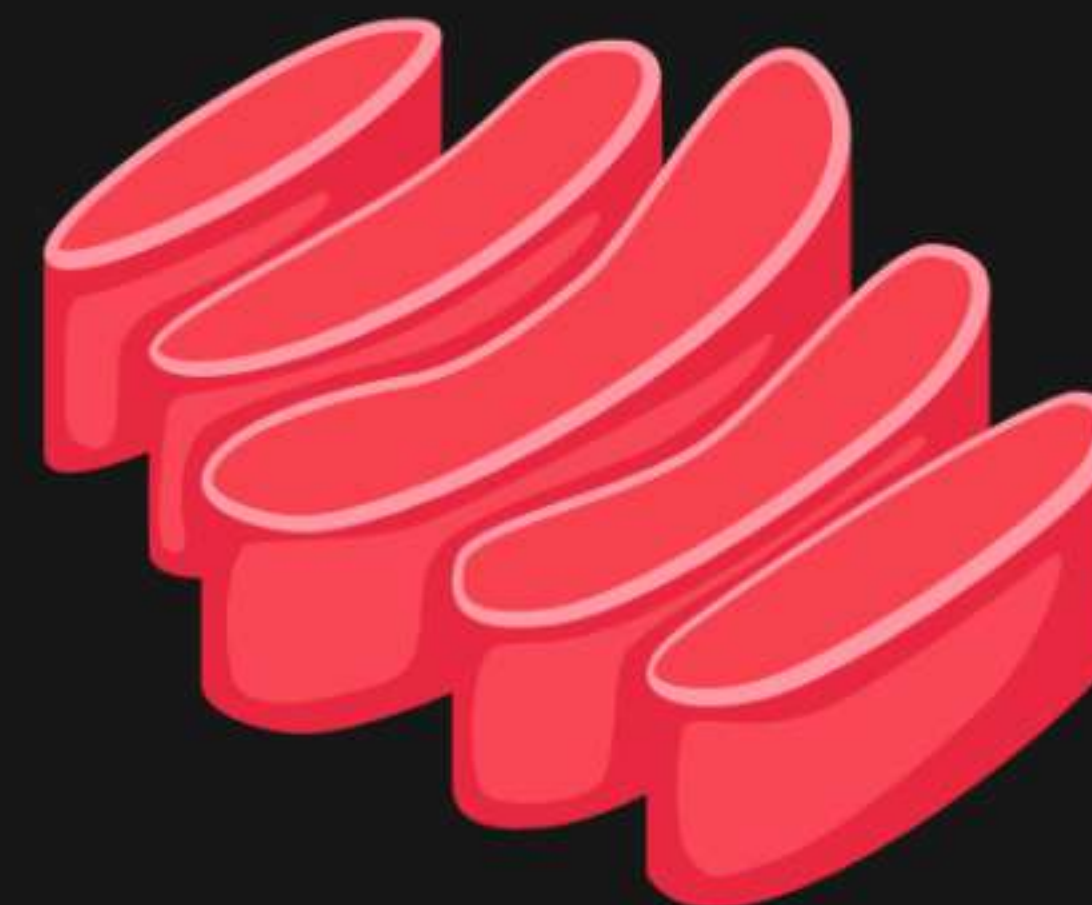
TYPES OF E.R.

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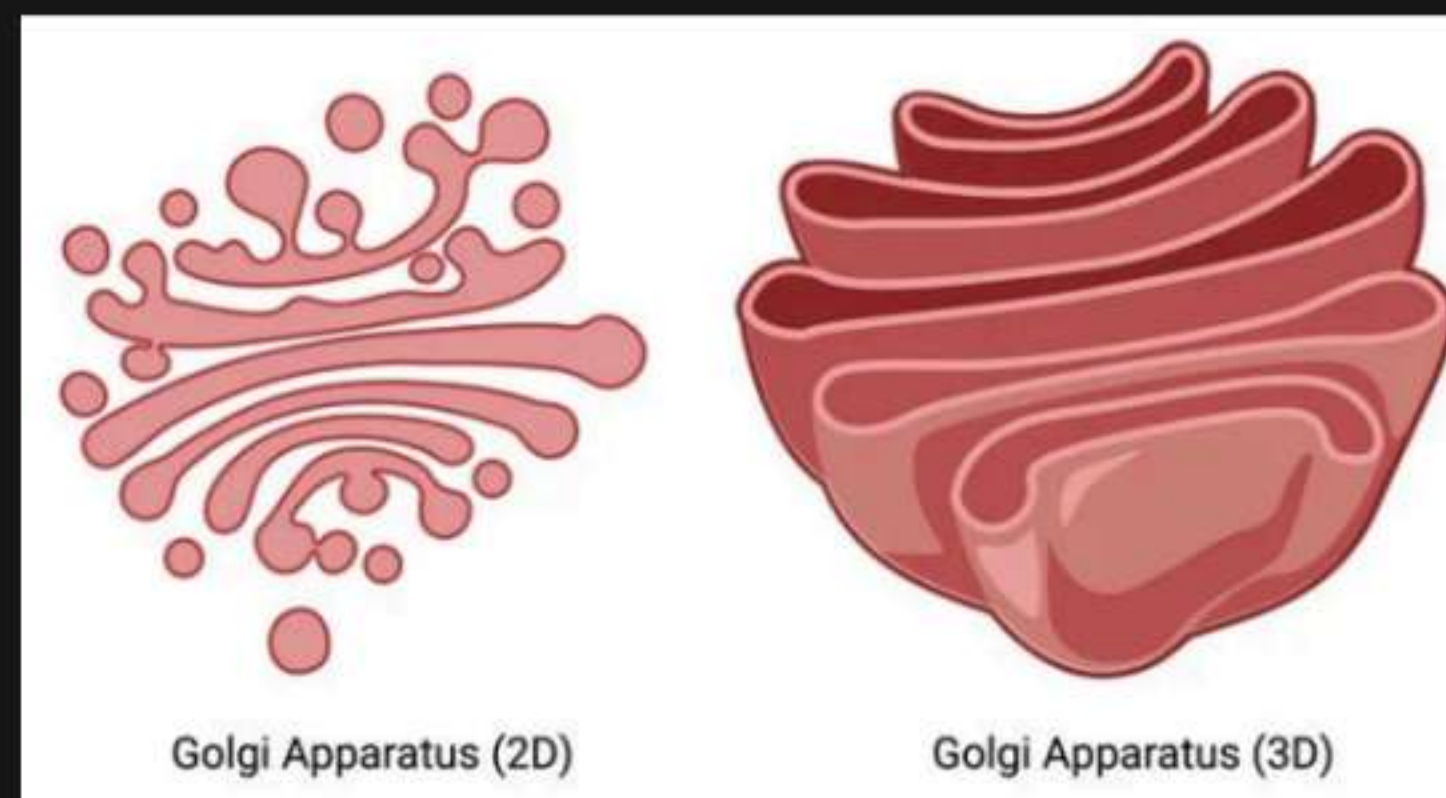
<u>Rough Endoplasmic Reticulum (RER)</u>	Smooth Endoplasmic Reticulum (SER)
Appears rough due to <u>ribosomes</u> ; sites of <u>protein synthesis</u> .	Smooth appearance; facilitates <u>lipid</u> , <u>enzyme</u> , and <u>hormone production</u> .
Ribosomes synthesize proteins.	No protein synthesis; functions in lipid production.
<u>Not involved in lipid production.</u>	Facilitates lipid synthesis.
No role in <u>enzyme or hormone synthesis</u> .	Functions in enzyme and hormone production.
<u>No detoxification capability.</u>	Crucial in <u>detoxification</u> , especially in liver cells.

GOLGI APPARATUS

- Named after its discoverer, Camillo Golgi.
- Comprises a system of membrane-bound vesicles arranged roughly parallel to each other in stacks known as cisterns.
- Facilitates the packaging and transportation of proteins across the cytoplasm.
- Performs functions such as storage, modification, and packaging of products in vesicles.
- Plays a role in the formation of lysosomes.



Traffic police of the cell



Golgi Apparatus (2D)

Golgi Apparatus (3D)

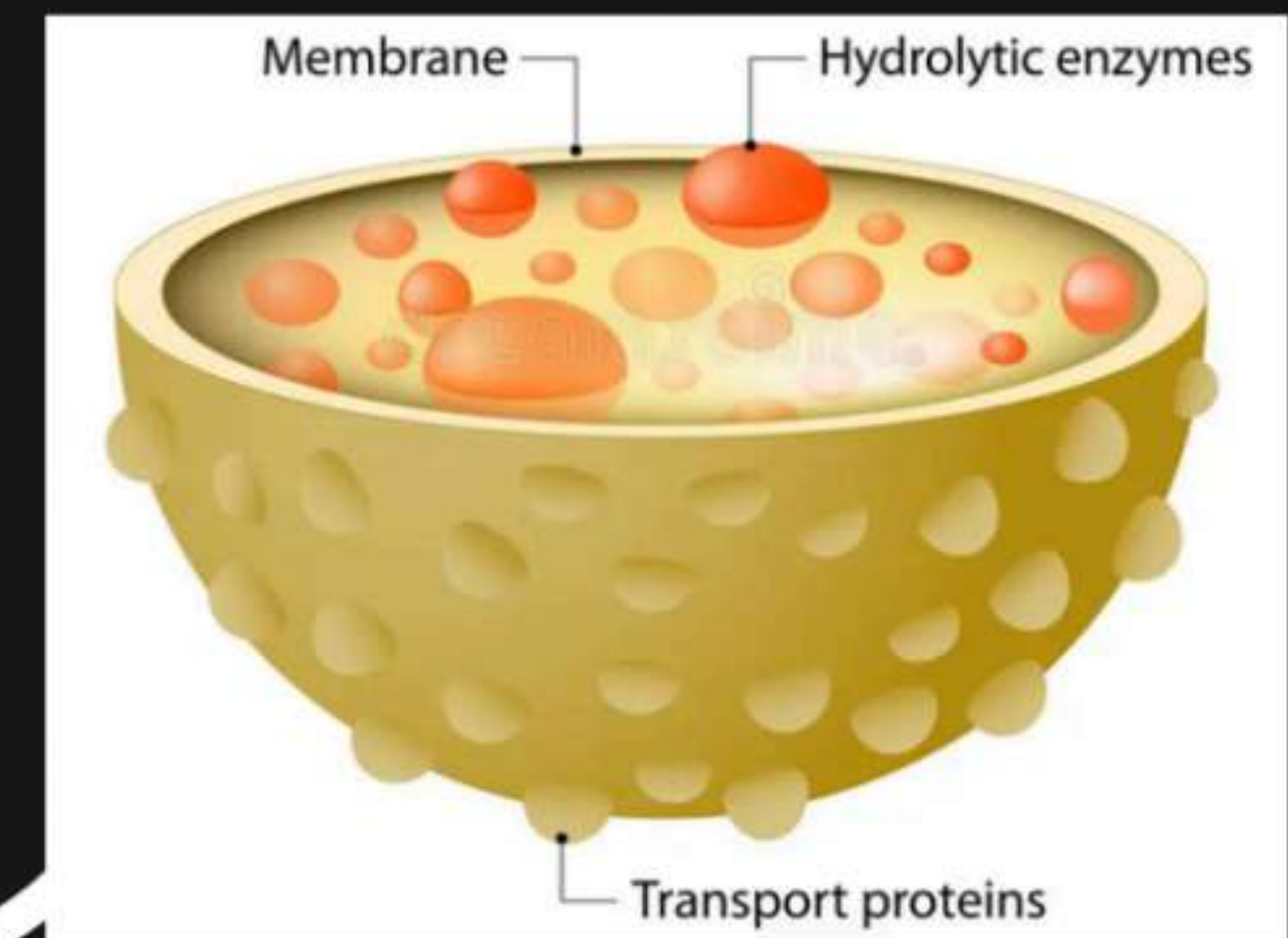
LYSOSOMES



Lysosomes are spherical, membrane-bound organelles filled with digestive enzymes that help break down various biomolecules. Lysosomes are formed from the Golgi apparatus, which packages enzymes into vesicles that become lysosomes.



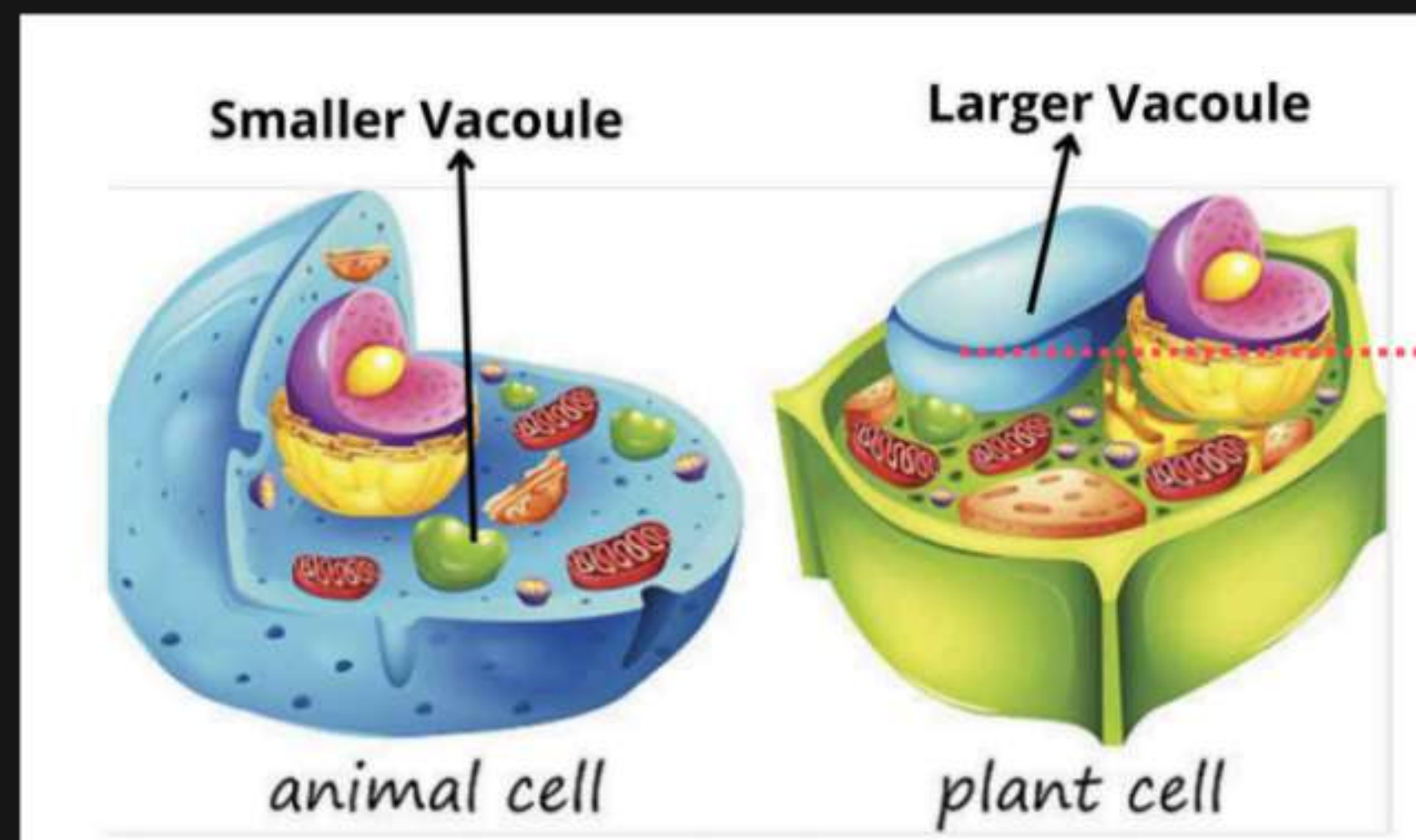
Suicidal Bags



- Lysosomes, filled with digestive enzymes from the RER, act as the cell's **waste disposal system**.
- They digest foreign material and worn-out organelles to maintain cell cleanliness.
- Lysosomes break down complex substances into simpler ones using **powerful enzymes**.
- Termed "**suicide bags**" as they may burst during cellular disturbance, leading to self-digestion.
- Involved in breaking down all organic material, including bacteria and old organelles.

VACUOLES ✓✓

- Vacuoles: **Storage sacs** in cells, **small in animals**, large in plants.
- Plant Central Vacuole: Occupies 50-90% of cell volume, filled with cell sap.
- Functions: **Provide turgidity and rigidity** to plant cells, **store essential substances**.
- Contents: **Amino acids, sugars, proteins**, and in single-celled organisms, consumed food items.
- **Specialized Roles:** **Expelling excess water** and wastes from unicellular organisms.

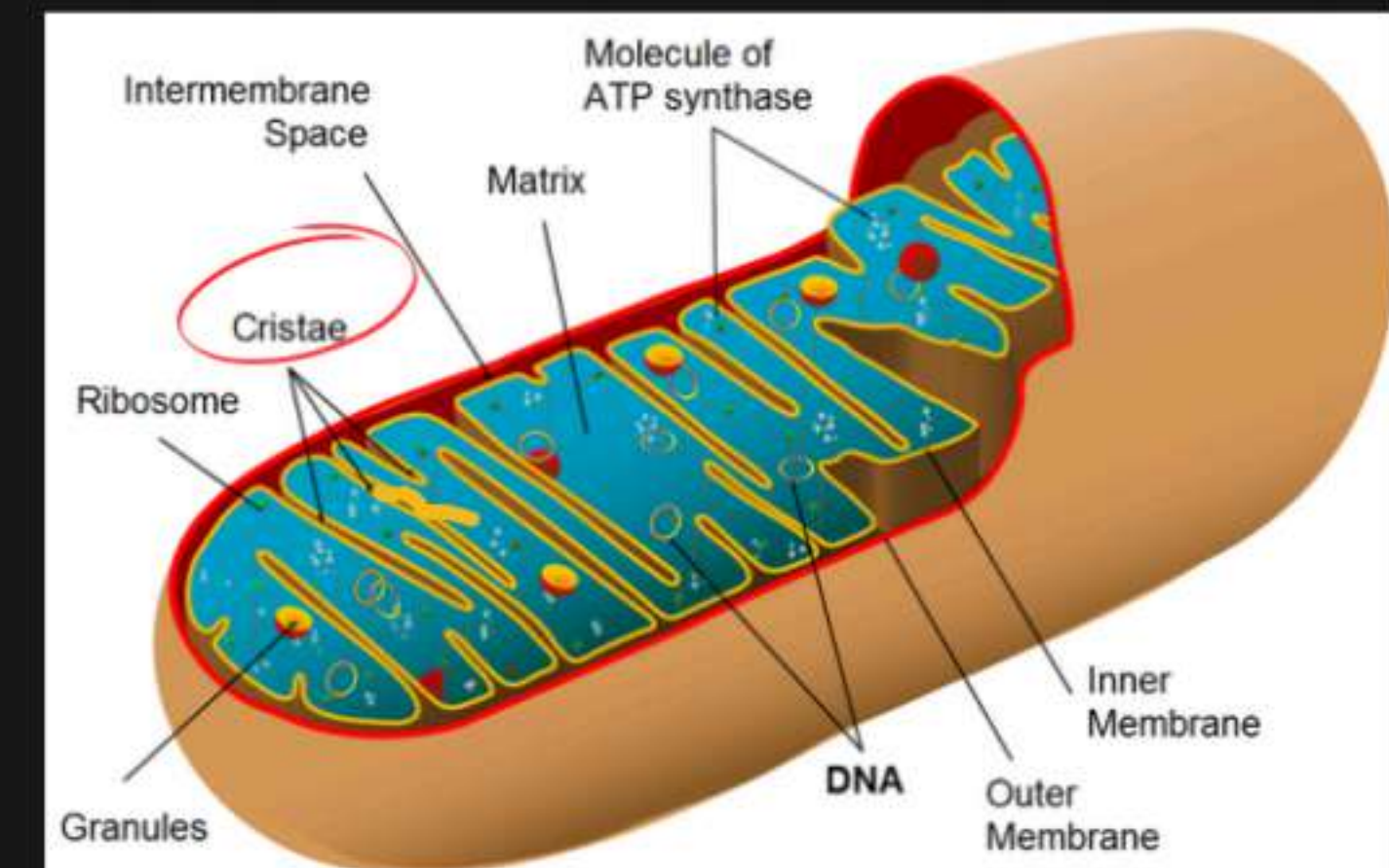


MITOCHONDRIA

→ (DNA + Ribosome)

Mitochondria are membrane-bound organelles known as the “**powerhouse of the cell**” because they generate energy in the form of **ATP** (Adenosine Triphosphate) through the process of cellular respiration.

Mitochondria are found in nearly all eukaryotic cells, including both plant and animal cells.



Structure of Mitochondria:

Double Membrane: ✓ Nucleus

- Outer Membrane: The outer layer is smooth and separates the mitochondrion from the rest of the cell.
- Inner Membrane: The inner layer has many folds called cristae that increase surface area, allowing for more space to produce energy.

Matrix:

- The inner space of the mitochondrion is filled with a fluid called the matrix, containing enzymes, DNA, and ribosomes necessary for energy production.

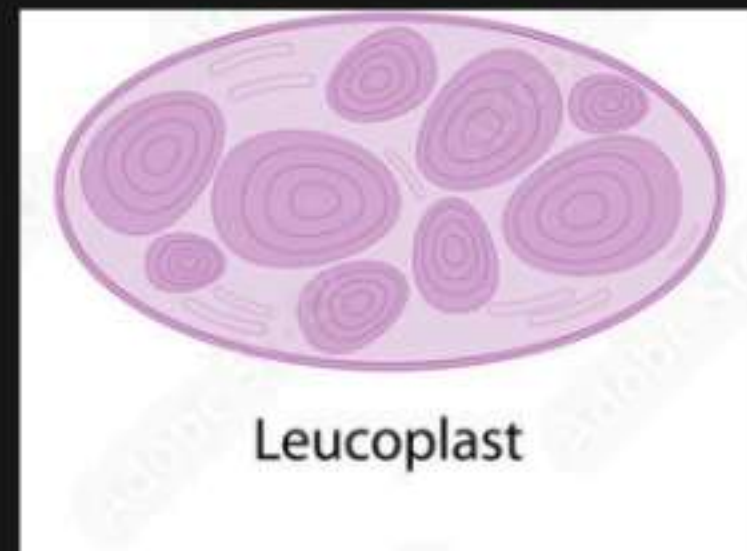
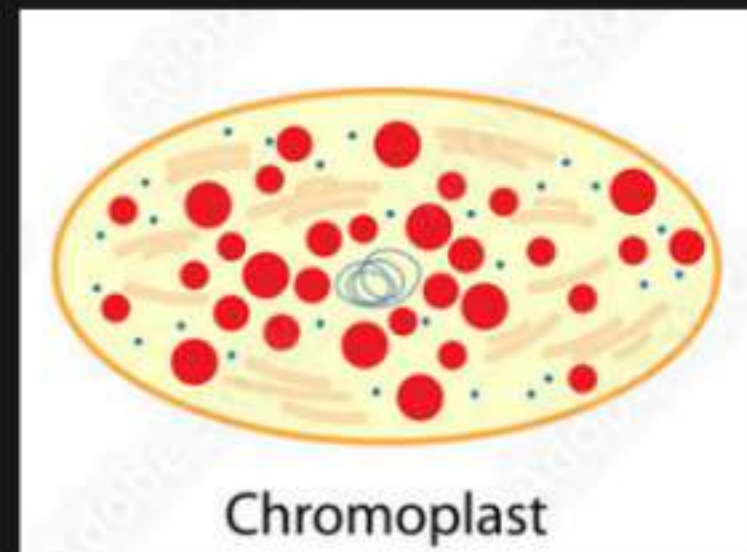
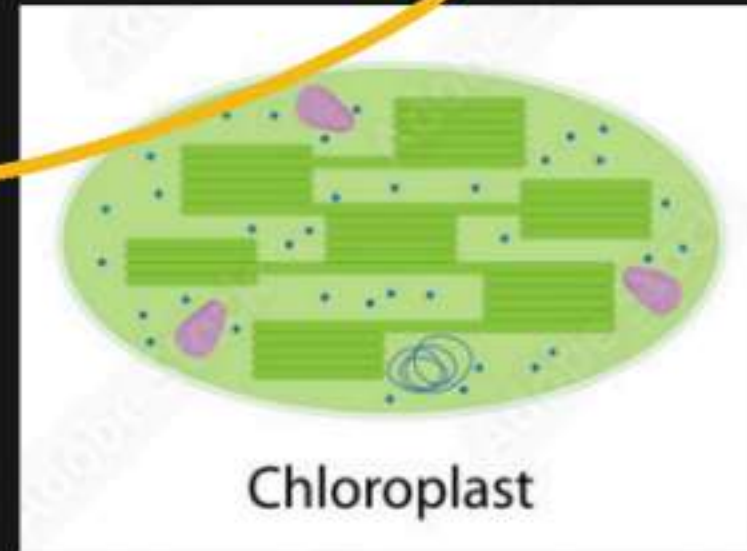
DNA PLASTIDS

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Plastids are important organelles found in plant cells.

Types of Plastids:

- **Chloroplasts:** Contain the green pigment chlorophyll and are responsible for photosynthesis, the process by which plants convert sunlight into energy.
- **Chromoplasts:** Contain pigments that give fruits and flowers their color (other than green). They help in attracting pollinators and seed dispersers.
- **Leucoplasts:** Colorless plastids that store starches, oils, and proteins. They are primarily found in non-photosynthetic tissues, such as roots and seeds.



1. Single Membrane-Bound Organelles:

These organelles are surrounded by only one layer of a membrane.

Examples: Lysosomes and vacuoles

2. Double Membrane-Bound Organelles:

These organelles have two layers of membranes, which help them carry out complex functions.

Examples: Nucleus, mitochondria, and chloroplasts (in plants).
 → Plastids

3. Non-Membrane Bound Organelles:

These organelles do not have any membrane around them and are directly in contact with the cytoplasm.

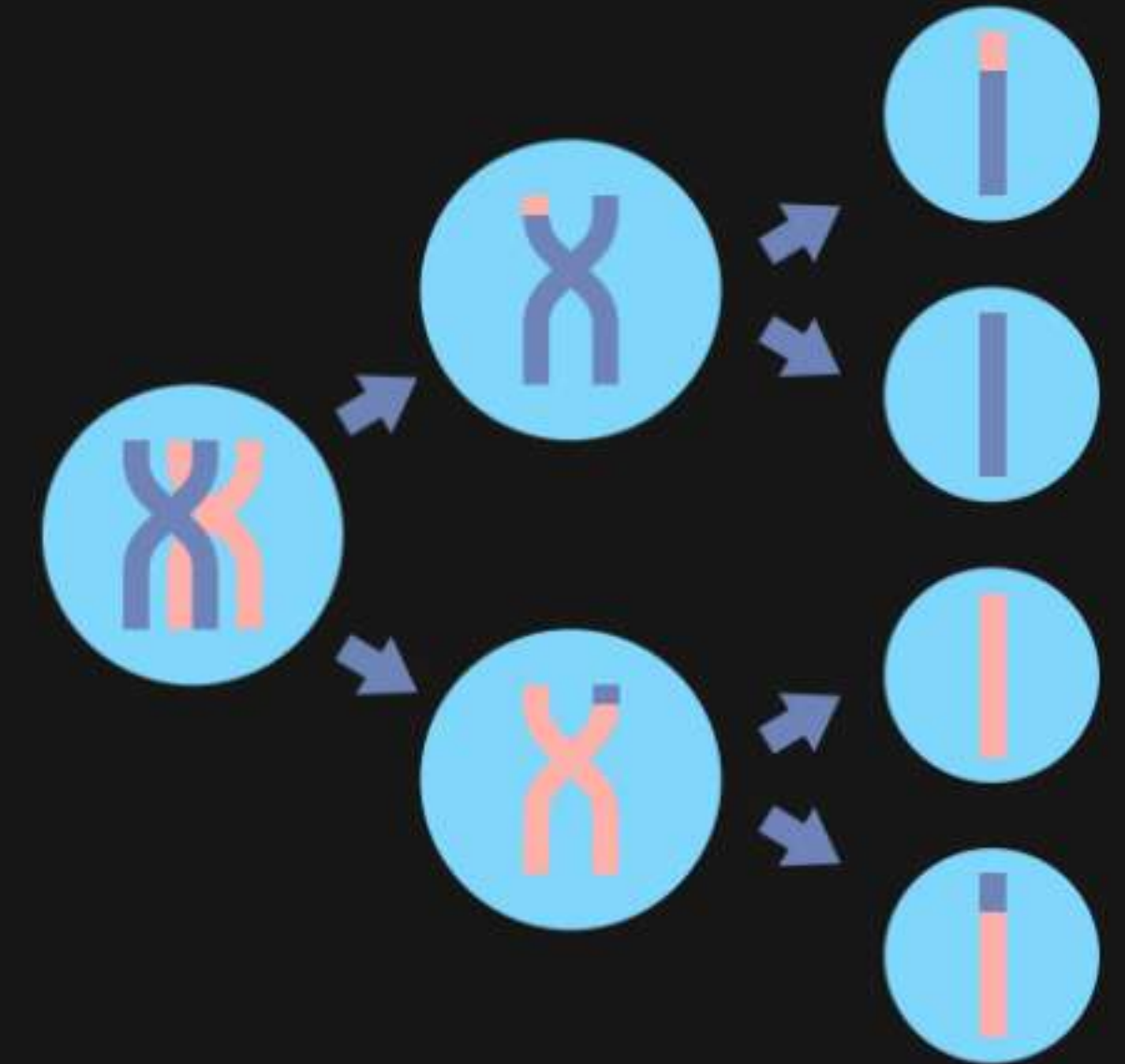
Examples: Ribosomes, centrioles, and the cytoskeleton.

Padhai ke Alawa

SAB MOH MAYA HAI

CELL DIVISION

Cell division is the process by which a parent cell divides into two or more daughter cells. It is essential for growth, repair, and reproduction in organisms.



TYPES OF CELL DIVISION:

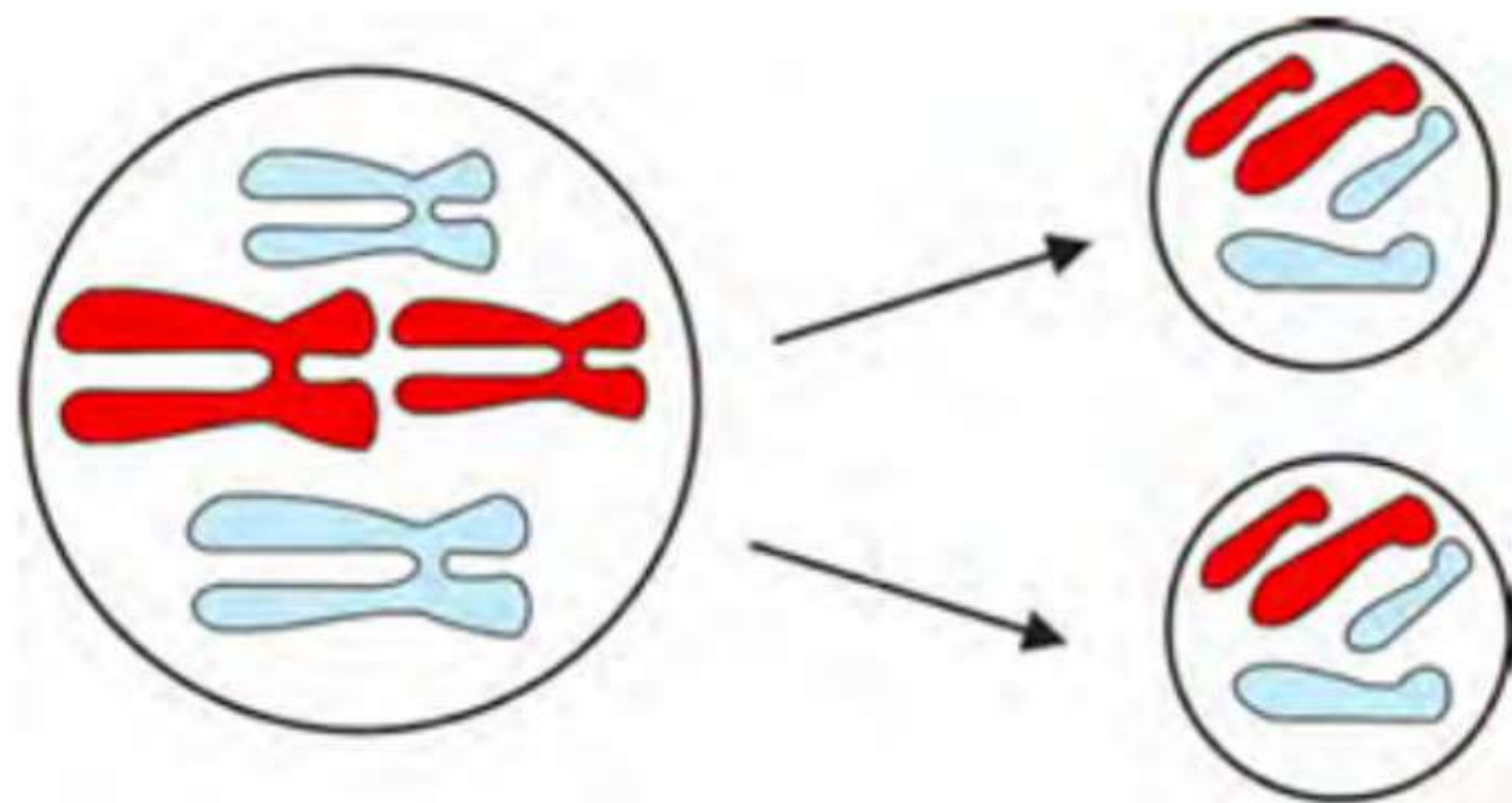


Fig. 5.7: Mitosis

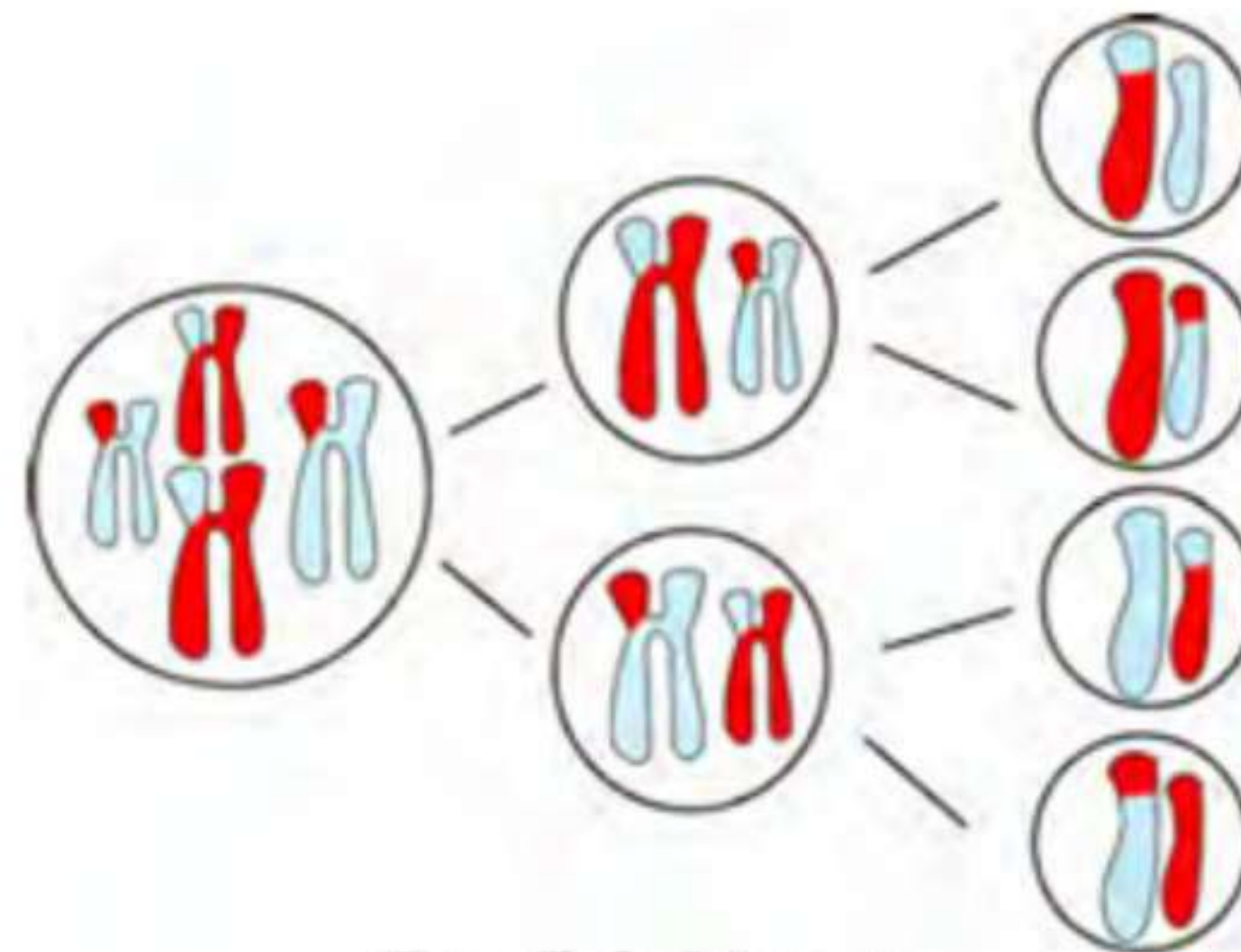


Fig. 5.8: Meiosis

Mitosis

It is a type of cell division where the number of chromosomes remains the same.

Two new cells are formed.

The new cells have the same number of chromosomes as the original cell.

It helps in growth and repair of the body.

Meiosis

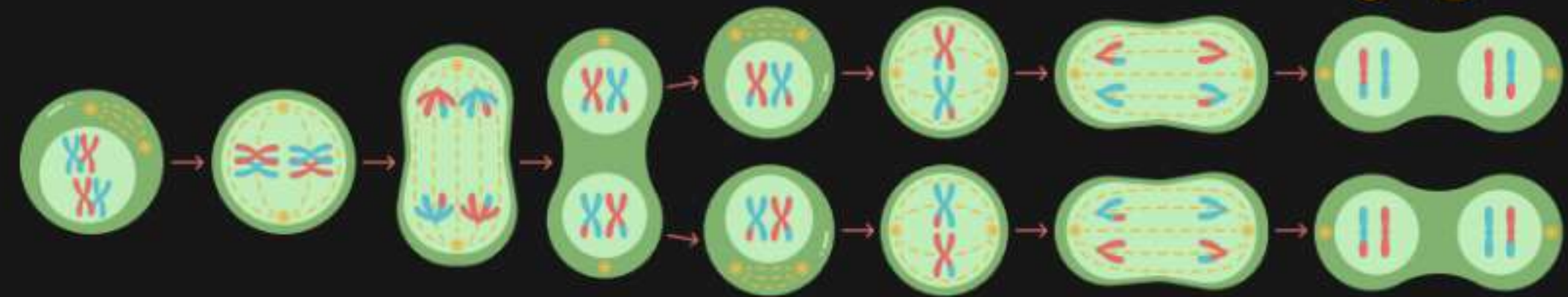
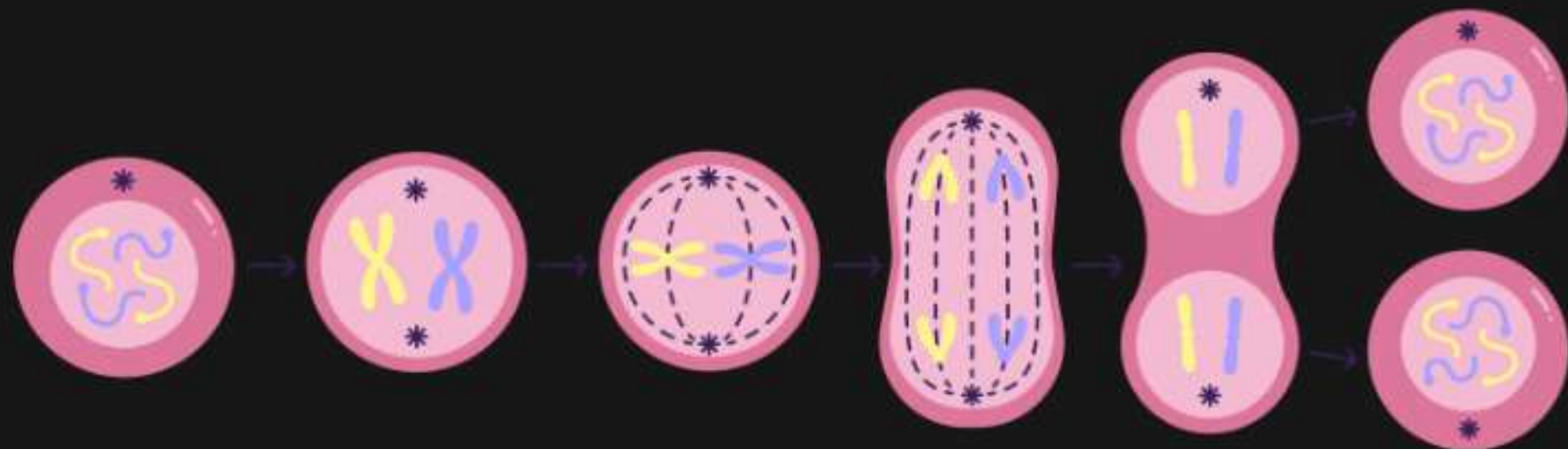
It is a type of cell division where the number of chromosomes is reduced to half.

Four new cells are formed.

The new cells have half the number of chromosomes as the original cell.

It is important for forming reproductive cells (gametes).

Sex cells



Similarities

Cell membrane: A protective layer that controls what enters and leaves the cell.

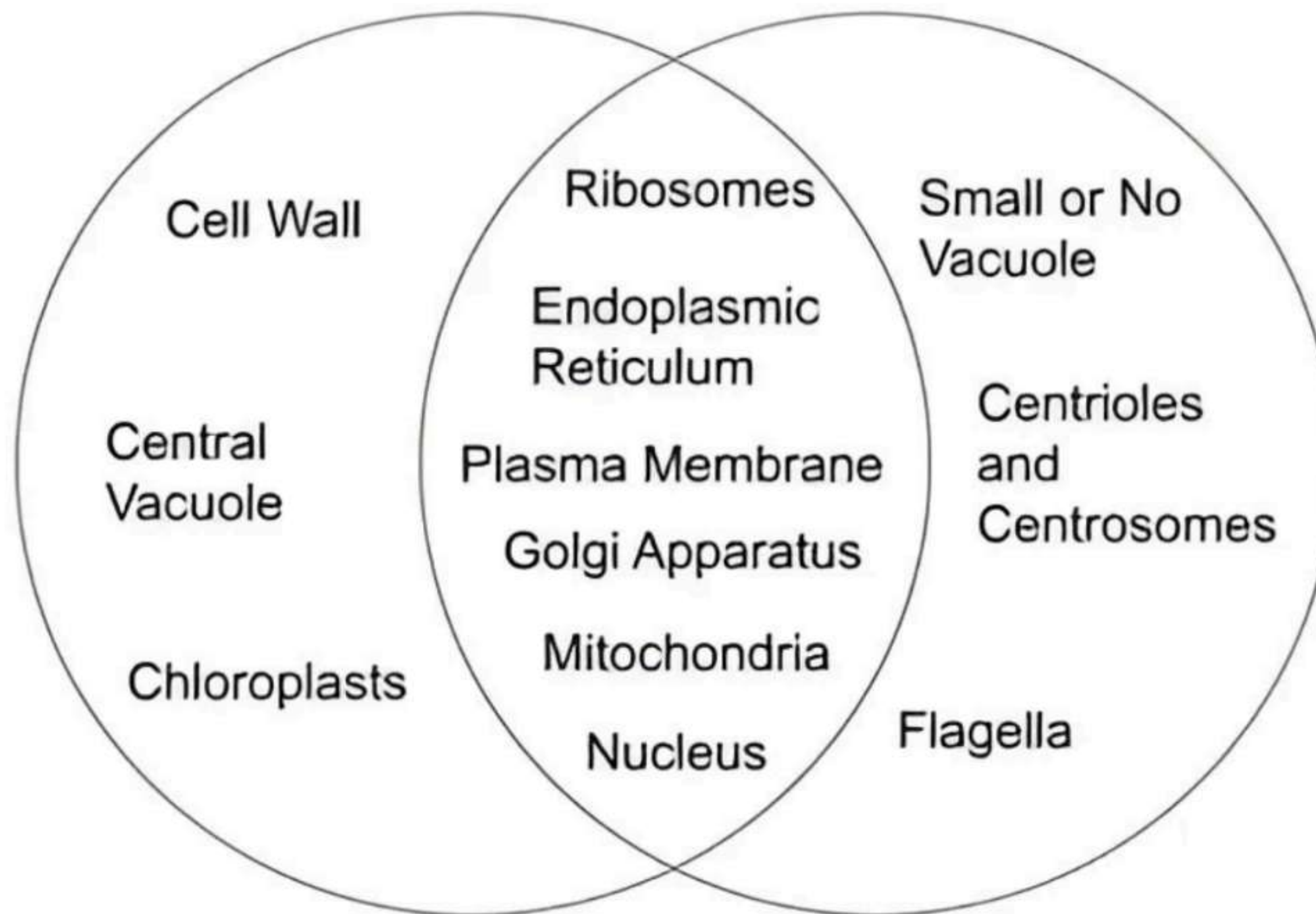
Nucleus: Contains genetic material (DNA) and controls cell activities.

Cytoplasm: A jelly-like substance where cellular reactions occur and organelles are suspended.

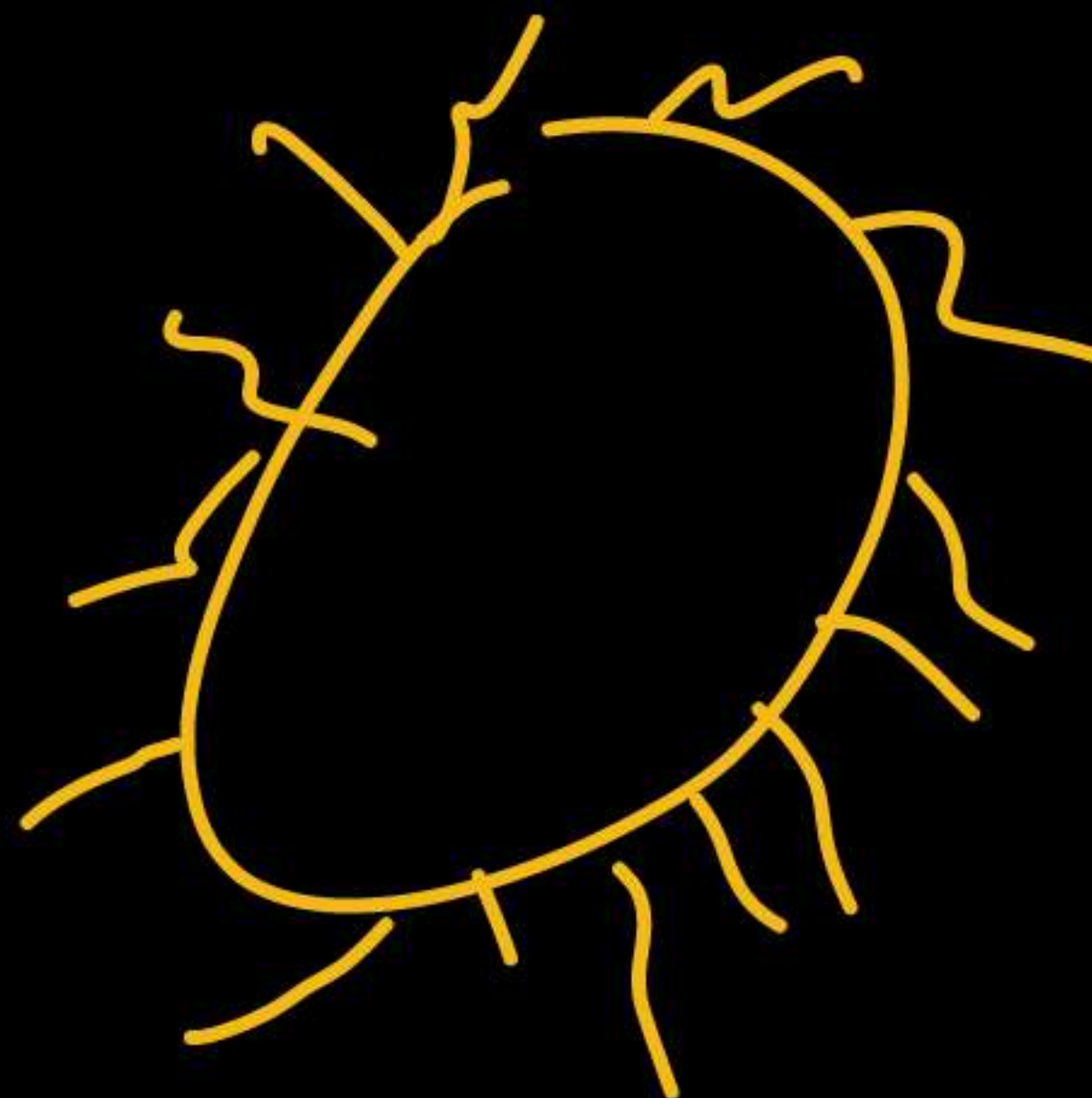
Both Plants and Animals cells contains Imp. cell organelles such as: Endoplasmic reticulum, Golgi apparatus, Ribosomes, Mitochondria.

Plant Cell

Animal Cell



Feature	Plant Cell	Animal Cell
Cell Shape	Square or rectangular in shape	Irregular or round in shape
Cell Wall	Present	Absent
Plasma/Cell Membrane	Present	Present
Endoplasmic Reticulum	Present	Present
Nucleus	Present and lies on one side of the cell	Present and lies in the center of the cell
Lysosomes	Present but are very rare	Present
Golgi Apparatus	Present	Present
Cytoplasm	Present	Present
Ribosomes	Present	Present
Plastids	Present	Absent
Vacuoles	Few large or a single, centrally positioned	Usually small and numerous
Cilia	Absent	Present in most of the animal cells
Mitochondria	Present but fewer in number	Present and are numerous
Mode of Nutrition	Primarily autotrophic	Heterotrophic



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1. Which of the following is not a function of the vacuole in plants?

- ~~(a)~~ They store toxic metabolic wastes
- (b) They help with the process of cell division
- ~~(c)~~ They help to maintain turgidity
- ~~(d)~~ They provide structural support

Let's do this!



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2. Lipid molecules are synthesized by:

- (a) SER
- (b) RER
- (c) Golgi apparatus
- (d) Plastids

SER
RER

Let's do this!



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3. The complete break down of glucose in presence of oxygen in a cell takes place in:

- (a) mitochondria
- (b) ribosome
- (c) chloroplast
- (d) golgi apparatus

Let's do this!



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4. The cell organelle involved in forming complex sugars from simple sugars are

- (a) Endoplasmic reticulum
- (b) Ribosomes
- (c) Plastids
- (d) Golgi apparatus

> Starch

Let's do this!



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5. What are lysosomes? Why are they called "suicide bags"?

digestive

- Lysosomes are membrane-bound organelles containing ~~hydrolytic~~ enzymes that help in breaking down waste materials, cellular debris, and foreign substances like bacteria.
- Lysosomes are called suicide bags because, in case of ~~damage~~ or malfunction, they release their digestive enzymes into the cell, which leads to the destruction of the cell itself.

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6.(a) What would happen to the life of a cell if there was no Golgi apparatus ?

(b) Which cell organelle detoxifies poisons and drugs in the liver of vertebrates ?

(a) Golgi apparatus is concerned with substances synthesized by ER, their storage, packaging of products in vesicles and transportation of them inside and outside of the cell. It is also involved in the formation of Lysosomes. Thus, Golgi apparatus greatly help in carrying out metabolic activities in the cell cytoplasm and save the cell from the strong digestive enzymes uncovered by membrane in lysosomes.

(b) Smooth endoplasmic reticulum.

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7. Why is mitochondria called power house of cell? Give three similarities and one difference between mitochondria and plastid.

Mitochondria are called the powerhouse of the cell because they generate energy in the form of ATP (Adenosine Triphosphate) through cellular respiration. This energy is used by the cell for various activities needed for life.

Three similarities between mitochondria and plastids:

1. Both have their own DNA and ribosomes, so they can make some of their own proteins.
2. Both are surrounded by a double membrane.
3. Both are involved in important cell processes: mitochondria in energy production and plastids in functions like photosynthesis and storage.

One difference between mitochondria and plastids:

Mitochondria are present in both plant and animal cells, while plastids are found only in plant cells.

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8. Give scientific reason for the following

(a) Inner membrane of mitochondria is deeply folded.

(b) Mitochondria are able to make some of their proteins.

(a) Inner membrane of mitochondria is deeply folded because these folds create large surface

area for ATP generating chemical reaction.

b) Mitochondria contain their own DNA and ribosomes and hence make their own proteins.



Aa gaye na
iss Chapter
me maje!!!

